

Mathematics for the Technologies 3

Course Description

Mathematics for the Technologies 3 is presented as the third in a sequence of courses to meet the state Algebra 1 and Geometry standards.

Mathematics for the Technologies is a program of mathematical studies focusing on the development of the student's ability to understand and apply mathematics to solve realistic workplace problems. Skills in geometry are taught through an integrative approach. Emphasis is on active participation through appropriate project work, laboratory activities, group and individual assignments, discussion, practice, and exposition. Students are expected to use scientific calculators, graphing calculators, and/or computers with dynamic, interactive software throughout the year. **Geometry: I.D.2.** Instructors are encouraged to incorporate workplace competency skills (oral and written communication, cooperative work) and work with occupational instructors and local business and industry personnel to incorporate career and technology applications of mathematics.

It is recommended that class size be no larger than twenty-two students due to the hands-on, laboratory-based nature of the courses.

Recommended Prerequisites

Students entering this course should have successfully completed Mathematics for the Technologies 1 and 2 or Algebra 1, having mastered the state-mandated standards.

Course Outline

The student who completes the Mathematics for the Technologies 3 will know and understand the following core materials:

- I. Exploration and overview of geometry.
 - A. Develop an awareness of the structure of a mathematical system, connecting definitions and postulates. **Geometry: I.A.1.**
 - B. Recognize that the study of geometry was developed for a variety of purposes and has historical significance. **Geometry: I.A.2.**
 - C. Explore attributes of geometric figures using constructions with **Geometry: I.B.1.**
 1. Straightedge and compass.
 2. Paper folding.
 3. Dynamic, interactive geometry software.
 - D. Make and verify conjectures of basic geometric terms. **Geometry: I.B.2.**
 - E. Explore the basic transformations. **Geometry: III.B.1., 2.**
 1. Translation.
 2. Rotation.
 3. Reflection.
 4. Dilation.
- II. Logical reasoning.
 - A. Define and use conditional statements. **Geometry: Part of I.A.1.**
 - B. Determine the truth value of the converse of a conditional statement. **Geometry: I.C.1.**
 - C. Use logical reasoning to draw conclusions about geometric figures from given assumptions. **Geometry: I.C.2.**
 - D. Construct and judge validity of a logical argument consisting of a set of premises and a conclusion. **Geometry: I.C.3.**
 - E. Use inductive reasoning to formulate a conjecture. **Geometry: I.C.4.**
 - F. Use deductive reasoning to provide an informal proof for a statement. **Geometry: I.C.5.**
- III. Lines and triangles.
 - A. Based on explorations and using concrete models and geometry software, formulate and test conjectures about properties of **Geometry: IV.B.1.a.**

1. Parallel lines.
 2. Perpendicular lines.
 3. Two parallel lines cut by a transversal line.
 - B. Use numeric and geometric patterns to make generalizations about **Geometry: II.A.1.**
 1. Angle relationships
 2. Inequalities in triangles.
 - C. Justify and apply triangle congruence relationships. **Geometry: V.B.2.**
 - D. Use congruence transformations to make conjectures about and justify properties of triangles. **Geometry: V.B.1.**
 - E. Identify, describe, and defend congruence between shapes. **Geometry: V.B.3.**
- IV. Polygons and quadrilaterals.
- A. Use numeric and geometric patterns to make generalizations about properties of **Geometry: II.A.1.**
 1. Polygons.
 2. Angle relationships in polygons.
 - B. Based on explorations and using concrete models and geometry software, formulate and test conjectures about properties and attributes of polygons and their component parts. **Geometry: IV.B.1.b.**
 - C. Analyze the symmetry of objects using the language of transformations. **Geometry: III.B.3.**
 - D. Use transformations and their compositions to make connections between mathematics and applications including tessellations or fractals, in particular with graphing calculators and geometry software. **Geometry: III.B.4.**
 - E. Find optimal solutions to problems involving paths, networks, or relationships among a finite number of objects. **Geometry: I.D.3.**
- V. Coordinate geometry.
- A. Given geometric figures, utilize a coordinate system to identify and justify conjectures. **Geometry: III.A.1.**
 - B. Use slopes and equations of lines to investigate geometric relationships of **Geometry: III.A.2.**
 1. Parallel lines.
 2. Perpendicular lines.
 3. Special segments of triangles.
 4. Special segments of other polygons.
 - C. Develop and use formulas including distance and midpoint. **Geometry: III.A.3.**
 - D. Given two ordered pairs **Geometry: III.A.4.**
 1. Find the distance between them.
 2. Locate the midpoint.
 3. Determine the slope of the line that contains them.
 - E. Plot coordinates for translations, and describe the vertical and horizontal transformational vector(s). **Geometry: III.B.1.**
- VI. Area and perimeter.
- A. Find areas of **Geometry: IV.A.1.**
 1. Regular polygons.
 2. Composite figures.
 3. Circles.
 - B. Using graphing calculators, spreadsheets, and dynamic, interactive geometry software, determine and describe the resulting change in the area and perimeter when one or more dimensions is changed, and apply this idea in solving problems. **Geometry: I.D.1., IV.A.5., V.A.7.**
- VII. Three-dimensional figures.
- A. Use numeric and geometric patterns to make generalizations about solid figures. **Geometry: II.A.1.**
 - B. Draw, examine, and classify cross sections of three-dimensional objects. **Geometry: II.A.3.**
 - C. Construct a three-dimensional object using a two-dimensional diagram, such as a blueprint or pattern. **Geometry: II.A.4.**
 - D. Use top, front, side, and corner views of three-dimensional objects to create accurate and complete representations and solve problems. **Geometry: I.D.1., II.A.5.**
 - E. Represent a three-dimensional object in two dimensions using graph or dot paper. **Geometry: II.A.6.**
 - F. Use formulas for surface area and volume of three-dimensional objects to solve practical problems. **Geometry: I.D.1., IV.A.4.**
 - G. Using graphing calculators, spreadsheets, and dynamic, interactive geometry software, determine and describe the resulting change in volume when one or more dimensions is changed. **Geometry: IV.A.5., V.A.7.**
- VIII. Similarity.
- A. Use numeric and geometric patterns to make generalizations about ratios in similar figures. **Geometry: II.A.1.**

- B. Identify, describe, and defend similarity between shapes. **Geometry: V.A.1.**
 - C. Justify conjectures about geometric figures using similarity and transformations. **Geometry: V.A.2.**
 - D. Utilize ratios to solve problems involving similar figures in a variety of ways, including the use of dynamic, interactive geometry software. **Geometry: I.D.1., V.A.3.**
 - E. Solve applied problems using scale modeling. **Geometry: I.D.1., V.A.4.**
 - F. Solve problems using proportion involving similar figures. **Geometry: I.D.1., V.A.8.**
 - G. Develop, apply, and justify triangle similarity relationships. **Geometry: V.A.5.**
- IX. Right triangles.
- A. Develop, extend, and use the Pythagorean Theorem. **Geometry: IV.A.3.**
 - B. Identify and use the right triangle theorems for **Geometry: II.A.2.**
 - 1. 45° - 45° - 90° triangles.
 - 2. 30° - 60° - 90° triangles.
 - C. Explore concepts and applications of trigonometry by solving applied problems, using right triangle trigonometry (sine, cosine, tangent). **Geometry: I.D.1., V.A.6.**
- X. Circles.
- A. Use numeric and geometric patterns to make generalizations about circles. **Geometry: II.A.1.**
 - B. Find areas of sectors and arc lengths of circles using proportional reasoning. **Geometry: IV.A.2.**
 - C. Based on explorations and using concrete models and geometry software, formulate and test conjectures about properties and attributes of circles and the lines that intersect them. **Geometry: IV.B.1.c.**